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June 5, 1995

VIA HAND DELIVERY

William F. Caton
Acting Secretary
Federal Communications Commission
Room 222
1919 M Street, NW
Washington, DC 20554

RECEIVED

JUN 5 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Re: Section 68.4(a) of the Commission's Rules
Hearing Aid-Compatible Telephones
Petition for Rule Making

DOCKET FILE COPY ORIGINAL

Dear Mr. Caton:

On behalf of Helping Equalize Access Rights in Telecommunications Now, or HEAR-IT NOW, we submit an original and four copies of the enclosed Petition for Rule Making.

Please contact the undersigned if you have any questions.

Sincerely yours,

Michael Ruger
Michael Ruger

cc: The Honorable Reed E. Hundt
The Honorable James H. Quello
The Honorable Andrew C. Barrett
The Honorable Rachelle B. Chong
The Honorable Susan Ness
Regina Keeney, Chief, Wireless Telecommunications Bureau

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BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, DC 20554

In the Matter of)
)
Section 68.4 of the Commission's Rules)
Hearing Aid-Compatible Telephones)

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

PETITION FOR RULE MAKING

Frederick H. Graefe
Michael C. Ruger
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DOCKET FILE COPY ORIGINAL

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Filed: June 5, 1995

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In the Matter of

Section 68.4(a) of the Commission's Rules
Hearing Aid-Compatible Telephones

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PETITION FOR RULE MAKING

1. Helping Equalize Access Rights in Telecommunications

Now, or HEAR-IT NOW,¹ through counsel, respectfully requests that the Commission issue a Petition for Rule Making to amend Section 68.4(a) of the Commission's Rules, 47 C.F.R. § 68.4(a), to specify that broadband PCS devices capable of voice transmission or reception must be hearing aid-compatible. Unless the Commission acts, the nation's four million hard of hearing individuals who rely on hearing aids may be unable to use PCS devices. Swift action by the Commission, however, will ensure universal access to advanced communications for all--including individuals who are hard of hearing.

Background

2. When Congress passed the Hearing Aid Compatibility Act of 1988 ("the Act"), it required the Commission to establish regulations to ensure reasonable access to telephone service by

¹ HEAR-IT NOW is a coalition of groups formed to promote equal access by the Nation's four million hearing aid wearers to advanced communications services. Members of HEAR-IT NOW include Self-Help for Hard of Hearing People, Inc., the Alexander Graham Bell Association for the Deaf and the Wireless Communications Council.

individuals who are hard of hearing.² In doing so, Congress clearly stated that "to the fullest extent made possible by technology and medical science, hard of hearing persons should have equal access to the national telecommunications network[.]"³ Virtually all telephones were required to be hearing aid-compatible under the Act, including new telephones and telephones associated with a new technology or service, although Congress directed the Commission to specifically exempt several categories of telephones, including those used with public mobile services and private radio services.⁴ At the same time, Congress directed the Commission to review periodically these exemptions.⁵ In response to this directive, the Commission announced that it would review these exemptions at least every five years.⁶ The exemptions must be revoked if the Commission determines that (i) revocation or limitation is in the public interest; (ii) continuation of the exemption without such revocation or limitation would have an

² 47 U.S.C. § 610(a). The Commission adopted the necessary regulations in 47 C.F.R. §§ 68.4, 68.112, 68.224, 68.316, and 68.414.

³ Pub.L. 100-394, Section 2 (1988)

⁴ 47 U.S.C. § 610(b)(2)(A).

⁵ 47 U.S.C. § 610(b)(2)(C).

⁶ See Access to Telecommunications Equipment and Services by the Hearing Impaired and Other Disabled Persons, 4 FCC Rcd 4596, 4600 (1989). While these exemptions have not been reviewed by the Commission since their initial promulgation in the Act, an Advisory Committee has been formed to negotiate regulations to specify the requirements for hearing aid-compatible telephones in workplaces, hospitals, certain other health care facilities, prisons, hotels and motels. See Public Notice, 9 FCC Rcd 6706 (1994).

adverse effect on hard of hearing individuals; (iii) compliance with the requirements for hearing aid-compatibility is technologically feasible for the telephones to which the exemption applies; and (iv) compliance with the requirements for hearing aid-compatibility would not increase costs to such an extent that the telephones to which the exemption applies could not be successfully marketed.⁷

3. The focus on information technology in the 1980's has given rise to a focus on personal communications technology in the 1990's. New PCS devices promise to offer a range of equipment that is capable of voice, data, and video transmission and reception. This will provide, in effect, the capability of combining a personal organizer, scheduler, spreadsheet and word processor, a high speed data terminal with almost instant access to any database in the world, a facsimile machine and a standard telephone into a single compact and portable unit. These new personal portable offices will increase mobility in society, and will extend the freedom of choice and the capabilities of the individual citizen. The advances that would be made in PCS technology, along with its potential concomitant impact on society, were unknown in 1988 when the Act was passed, but were clearly anticipated, as indicated by the inclusion of "new technology or service" within the scope of the hearing aid compatibility requirements.⁸

⁷ 47 U.S.C. § 610(b)(2)(C); 47 C.F.R. §68.4(a)(4).

⁸ 47 U.S.C. § 610(b)(3).

4. The FCC is currently engaged in a process of auctioning licenses for a portion of the available PCS spectrum. Successful bidders in this auction are selecting basic operating systems, as well as the types of equipment to be used with those systems. One available PCS operating system is the Global System for Mobile Communications (GSM), which has been proven to be incompatible with most hearing aids. As the attached studies demonstrate, operation of a GSM device by a hearing aid wearer, in virtually all instances, created significant interference to the hearing aid, causing discomfort to the wearer and temporarily disabling the hearing aid. Indeed, in some cases, hearing aid wearers standing within several meters of a person using a GSM telephone experienced interference.⁹ A videotape demonstrating the interference to a hearing aid caused by a mobile telephone utilizing the GSM digital standard is also attached.¹⁰

5. The European response to GSM-created interference has not been to require the telephone manufacturers to make the telephones hearing aid compatible, but rather to require hearing aid and other electronic device manufacturers to develop shielding mechanisms to

⁹ See Exhibits 1 through 5, which consist of the texts of studies regarding GSM interference conducted by the National Telecom Agency of Denmark; the National Audiology Centre, Auckland, New Zealand; the National Acoustic Laboratories of Sydney, Australia; and British Telecom Laboratories. The level of interference experienced by the hearing aid wearer is dependent on several factors, including the type of hearing aid, the power level of the GSM device, and the proximity of the GSM device to the ear.

¹⁰ See Exhibit 6, which is an excerpt from a BBC Television program entitled "Tomorrow's World," broadcast on October 29, 1993.

protect those devices from harmful interference. Hearing aid shielding devices present a host of problems for manufacturers, however, in part because of the small size of hearing aids. Furthermore, hearing aids currently used by four million Americans could not be retrofitted with shielding devices. Consequently, hearing aid wearers would have to purchase new, shielded hearing aids, or would have to forego use of this new communications technology.

Discussion

6. In light of previous Congressional directives, as well as the European experience with GSM technology and its effects on hearing aids, it is clear that the Commission must act to ensure hearing aid compatibility for this new generation of telecommunications technology. Indeed, the possibility that companies may introduce GSM-based technologies for PCS devices--technologies that have been proven to create severe interference to hearing aids--compels immediate action.

7. A limited revocation of the Act's exemptions for private radio services or public mobile services, insofar as PCS devices fall within those categories, is warranted under the four guidelines set forth in the Act for the elimination of such exemptions.¹¹ First, revocation of the exemption would serve the public interest. Within the next few years, hundreds of thousands, if not millions, of PCS devices will be in operation. Unless the

¹¹ See supra at pp. 2-3. See also 47 U.S.C. § 610 (b) (2) (C); 47 C.F.R. § 68.4(a)(4).

devices are hearing aid-compatible, however, some four million Americans will be excluded from this next phase of the communications revolution.¹²

8. Second, continuation of the exemption for PCS devices capable of transmitting or receiving voice communications presents a serious economic threat to individuals who are hard of hearing. As explained above, GSM devices create significant interference to hearing aids, which, in turn, creates significant discomfort to hearing aid users. As a result, a hearing aid wearer would be precluded from using a GSM device in conjunction with an existing hearing aid, and could even encounter interference caused by a nearby GSM user. Even if shielding is developed for certain new models, the small size of other hearing aids may preclude the inclusion of shielding mechanisms.

9. Furthermore, mandating hearing aid compatibility for broadband PCS devices before those devices are introduced in the United States will serve not only to protect hearing aid wearers but the wireless industry as well. Future retrofitting of wireless communications to permit hearing aid compatibility would be costly, time-consuming and disruptive to the wireless industry. Indeed, the costs associated with retrofitting led the Commission to stay in part its rules regarding hearing aid-compatible telephones in

¹²Even if effectively shielded hearing aids could be developed, hearing aid wearers would be forced to absorb the costs of the new devices as few insurance plans pay for hearing aids. Current costs for hearing aids vary from several hundred to several thousand dollars, depending on the manufacturer, the vendor, the style of the hearing aid and the functions associated with the aid.

workplaces, hospitals, other health care facilities, prisons, hotels and motels. As a result, some seven years after the Hearing Aid Compatibility Act was adopted, people who wear hearing aids are still not able to use all telephones in public places, and businesses and organizations still face costs associated with retrofitting their existing telephones. By mandating compatibility before broadband PCS devices are introduced, however, the Commission will protect hearing aid wearers as well as the wireless industry from the high cost of retrofitting, while ensuring that individuals who are hard of hearing can use the new technology from the outset.

10. Third, compliance with existing hearing aid compatibility regulations is technologically feasible. While the European emphasis has been placed on designing GSM-compatible hearing aids, it is also possible to design GSM devices to reduce substantially the effects of interference. For instance, a reduction in maximum operating power, or a relocation of the transmitter portion of the device away from the hearing aid, may significantly alleviate the problem. To date, however, it appears that these options have not been explored.

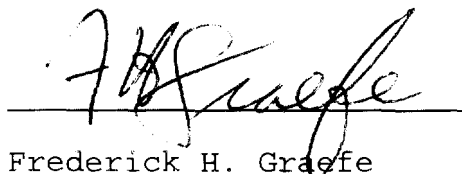
11. Finally, compliance with the hearing aid compatibility regulations would not increase costs to such an extent that the devices would not be marketable. Since no PCS devices are currently in operation in the United States, no existing users will be affected. Furthermore, there is no GSM-dependent infrastructure in place that would be subject to costs related to compliance.

Indeed, compliance would likely save hearing aid manufacturers millions of dollars in costs related to the development of improved devices, and would save hearing aid wearers tens of millions of dollars in costs associated with replacing their hearing aids to avoid interference.

Conclusion

12. By requiring broadband PCS devices to comply with current regulations regarding hearing aid compatibility, the Commission will help to protect four million hard of hearing individuals who wear hearing aids from severe interference, and will ensure that those individuals are capable of fully enjoying the benefits of PCS devices. Accordingly, HEAR-IT NOW respectfully requests that the Commission initiate a rulemaking proceeding to amend Section 68.4(a) of the Commission's Rules to specify that PCS devices capable of voice transmission and reception must be hearing aid-compatible.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "F. H. Graefe", is written over a horizontal line.

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June 5, 1995

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28 June 1994

***Interference with hearing
aids caused by GSM
digital cellular telephones
and DECT
digital cordless telephones***

*Conclusive Report by the
Working Group on GSM and
DECT telephones and
hearing aids*



**National Telecom Agency
Denmark**

**INTERFERENCE WITH HEARING AIDS CAUSED BY GSM DIGITAL CELLULAR
TELEPHONES AND DECT DIGITAL CORDLESS TELEPHONES**

Conclusive Report by the Working Group on GSM and DECT telephones and hearing aids

28 June 1994

List of Annexes and Appendices (available in Danish only)

Annex 1

Laboratory Report on immunity measurements made by DELTA, the Technical-Audiological Laboratory (TAL) and Telecom A/S

Appendix 1

The National Telecom Agency's covering letter when forwarding the 1st Report

Appendix 2

The Minister's letter directing the Group to continue its work

Appendix 3

Terms of reference of the Working Group dated 17 March 1993

Appendix 4

Correspondence about the extension of the terms of reference of the Working Group

Appendix 5

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Appendix 6

List of participants in the ad hoc Information Group

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1. CONCLUSIONS AND SUMMARY

1.1. Conclusions

On the basis of a Report of 10 June 1993 prepared by the Working Group on GSM and Hearing Aids (WGH) the Working Group has continued to work on the implementation of an Action Plan approved by the Minister.

At a certain point it was decided to extend immunity measurements to comprise, apart from GSM, the immunity of hearing aids to signals from the coming digital cordless telephone system, DECT (Digital European Cordless Telecommunications).

Interference from both GSM and DECT is caused by the special nature of radio signals due to the principle of time division multiple access (TDMA) used. Interference becomes manifest by e.g. the occurrence of a very unpleasant snarling tone, the basic frequency of which depends on the repetition frequency of the radio system.

The measuring programme covered hearing aids represented on the Danish and Norwegian markets and the development of specifications for the measurement of interference and disturbances caused to hearing aid users by radio systems using TDMA.

50 different types of hearing aid were measured, together representing 90 % of hearing aids supplied in Denmark during the period 1991-1993.

As regards measurements of hearing aids specific of Norway, eight additional types selected by the Norwegian Telecommunications Regulatory Authority (NTRA) were measured. Together, these measurements cover 85 % of hearing aids supplied in 1993 in Norway.

The measuring programme showed that problems of interference are connected, to a large degree, with the aid user's own use of GSM or DECT telephones.

Further, the measuring programme showed that 82 % of hearing aids are not disturbed by persons other than the aid user using hand portable 2 W GSM telephones. Similarly, it is estimated in the case of DECT, that the user will experience no interference with his hearing aid from DECT telephones used by other persons.

This means that **only in** a few cases will there be interference with hearing aids caused by other persons using GSM telephones.

Out of the total of hearing aids, 16 % are immune to the extent that they may be used together with a hand portable GSM telephone used in the same ear as the hearing aid.

It may thus be **concluded** that 84 % of hearing aids do not display a degree of immunity to allow them to be used in the same ear as a hand portable GSM telephone.

It also appears from the Report, that 62 % of hearing aids cannot be used together with a hand portable 2 W GSM telephone.

In a group of hearing aids, 22% of the total, it has been found that some of them may be used together with a hand portable GSM telephone using the ear not wearing hearing aid, provided that only one ear is wearing a hearing aid and the hearing faculty of the other ear is fairly good. The Working Group is unaware of the percentage of hearing aid users in Norway and Denmark able to turn this solution to account.

Similarly, 26% of hearing aids are immune to a degree allowing them to be used together with a DECT telephone in the same ear. On the other hand, 74 % of hearing aids are not suited for being used together with a DECT telephone in the same ear.

The measuring programme showed further that the degrees of immunity of the various types of hearing aid vary considerably. Not surprisingly, the smallest types intended to be worn in the ear itself displays the highest degree of immunity; hearing aid users, when using these types of aid, may use a GSM or DECT telephone without experiencing any interference with the functioning of the telephone.

In connection with the expected introduction of wireless PABXs, the distribution of DECT may have certain consequences for aid users in relation to their employment situation, if it turns out that a large proportion of hearing aid users will be unable to use a DECT telephone.

It should be noted, however, that it will take a couple of years before cordless PABXs are available in the market. This means that already now it should be possible to prevent this trend.

On the basis of these results, the Working Group has submitted proposals for informative activities to follow up on the results of the measuring programme.

These activities will be concentrated on the circulation of an informative letter to the audiological clinics of the country; further, on information of hearing aid users through the organizations of the hearing-handicapped. Finally, GSM operators will inform their customers through their respective newsletters.

The Working Group has also followed the international standardization work, and at the moment it is expected that standards will be ready to be brought to a vote in IEC and CENELEC at year-end 1994.

On the basis of a study of the relationship between Directive 89/336/EEC (the EMC Directive) and Directive 93/42/EEC (2nd Directive concerning medical devices) the Working Group has concluded that as from 1 January 1996, there will be essential requirements to the immunity of hearing aids.

1.2. Summary

The Report follows the Action Plan suggested in the first Report, describing the measurements made of a selected number of hearing aids.

Introduction and background

The introduction of the Report describes changes in the terms of reference of the Working Group in consequence of additional measurements of DECT telephones, and changes in the composition of the Working Group. Five meetings were held in the Working Group.

DECT systems

DECT is a digital cordless telephone system which is expected to have a great future with the business community. Employees equipped with a cordless telephone may be able to answer calls without having to be near an ordinary telephone. The DECT system may be extended to comprise wireless-only exchanges.

DECT is operating at a frequency with a lower output power and at a frequency twice that of GSM. 250 mW against the 2 W of a GSM telephone. DECT uses TDMA, as is the case of GSM. The repetition frequency of DECT is 100 Hz, against 217 Hz for GSM. This may give rise to interference with hearing aids operating at this lower basic frequency.

Preparation of specifications for the measurement of interference and disturbances. In order to be able to measure the immunity of hearing aids to GSM and DECT signals, it was necessary in the first instance to prepare specifications for the measurements. Specifications for estimating interference were developed by DELTA, the Technical-Audiological Laboratory (TAL) and Telecom A/S, the Telecom Denmark Laboratories (TD-L). The method was established in connection with the "EHIMA GSM project development phase" which was previously carried out at the laboratories for the European Hearing Instrument Manufacturers Association (EHIMA) and is based on the assumption that the hearing aid is exposed to an electromagnetic field of 10 V/m corresponding to the field strength at a distance of 1 meter from a 2 W hand portable GSM telephone. The electromagnetic signal directed towards the hearing aid is modulated so as to simulate the signal from a GSM or DECT telephone, respectively.

The hearing aids are so oriented in the direction of the interfering signal that they are exposed to the greatest possible radiation which implies a worst-case situation.

The signal interfering with the hearing aid is studied by means of a digital signal processing method allowing the individual components of the signal to be analyzed; the individual components may be corrected with the result that the interfering signal may be weighted to adapt to the frequency response of the hearing aid and its gain (OIRIL).

The level of interference was fixed at the level where the interference, i.e. the buzzing tone and its harmonic, reaches a sound pressure level of 55 dB OIRIL, a level which by test persons of normal hearing is not perceived as disturbing.

On the basis of this interference level, the hearing aids were divided into four categories (in the case of DECT, only two), according to their measured immunity. As far as category I is concerned, hearing aids of this category may be used together with a hand portable 2 W GSM telephone, whereas category IV covers hearing aids displaying interference in connection with persons other than the aid user using GSM telephones. Between these two extremes are categories II and III; of these, category II may in certain situations be used by the

hearing-handicapped when a GSM telephone is used in the ear opposite that which is wearing the hearing aid, whereas hearing aids of category III probably cannot be used together with a 2 W portable GSM telephone. Hearing aids of categories I, II and III, as a minimum, are not influenced by other persons using GSM telephones.

Category I for DECT is like category I for GSM, whereas category II for DECT covers hearing aids which cannot be used in the ear opposite that wearing the hearing aid.

Measurement of selected hearing aid types.

The types of hearing aid subjected to immunity tests have been selected on the basis of tenders for hearing aids invited during the period 1991-1993. Two aids of each type were measured, and based on the figures in the tenders it may be estimated that the measurements cover 90 % of hearing aids supplied in 1991-1993.

As far as Norwegian hearing aids are concerned, a supplementary number of types were measured, selected by the NTRA and representative of aids supplied in the Norwegian market in 1993. In total, the measured types represent 85 % of the types supplied in Norway in 1993.

The measuring programme was mainly financed by the Danish GSM operators but also TAL, Telecom A/S, TD-L made contributions. As regards measurements of hearing aids of special interest to the Norwegian market, the NTRA covered these expenses.

The results are given in tabular form arranged according to categories of hearing aids and according to types. The tables show the number of supplied aids of each type and category. On the basis of these results, the conclusions of section 1.1 above were drawn.

Possible remedies

The Working Group has studied various possibilities of remedying interference. Two possibilities seem to present themselves: either to improve the immunity of hearing aids or to change the construction of DECT telephones.

A survey has been made of the possibilities of improving the immunity of hearing aids by changing their construction. A number of methods is given whereby the immunity of hearing aids may be improved either by reducing their physical size or through use of decoupling components or increased shielding of their cabinets by metallization. Due to the already small size of hearing aids, however, some of these methods involve difficulties of a purely practical nature.

Attention is drawn to the fact that it will hardly be economically feasible to make any improvements of existing hearing aid types due to their construction which does not immediately allow any modifications.

As far as DECT telephones are concerned, proposals for a number of solutions were prepared making it possible, through simple changes of the construction of the telephones, to reduce interference. These solutions involve that the DECT telephone is either removed as

far away from the hearing aid as possible or that the antenna deflects the radio signals away from the hearing aid.

Information activities

To coordinate the information activities which seem necessary after publication of the Report, and to establish their extent, the Working Group set up an ad hoc Group with the task of organizing these activities.

On the basis of the measurement results and of the conclusions of the Report, an information programme was put together, essentially to inform users of hearing aids, partly through the audiological clinics but also through the organizations for the handicapped. In connection with the information of clinics, the Working Group prepared an informative letter to the audiological clinics of the country; the letter appears as Appendix 6 to this Report. Besides, it was agreed that the hearing aid industry would take steps to arrange a "feature day" to highlight the issue.

Finally, the GSM operators, Tele Danmark Mobil A/S and Sonofon, will inform their customers through their newsletters.

It has been agreed that all information activities are to begin immediately after publication of the Report; they are expected to be concluded in the course of the third and fourth quarter of 1994.

Promotion of international standardization work

The Working Group followed the international standardization work within IEC and CENELEC. These two organizations are preparing standards for the immunity of hearing aids to electromagnetic impact.

The first Report submitted by the WGH Group and the consequent political follow-up contributed to a rapid development of standards in IEC and CENELEC. It is expected that already at the end of 1994, standards will be circulated for voting in the two organizations and it may be envisaged that finalized product standards will be available in early 1995.

The Working Group studied the relationship between the EMC Directive and the 2nd Directive concerning medical devices, as hearing aids are covered by the latter. In the course of these studies it was considered when, in pursuance of these Directives, essential requirements to the electromagnetic immunity of hearing aids may be made. It now seems evident, therefore, that no essential requirements to the immunity of hearing aids may be made before 1 January 1996 but after that date, hearing aids must conform to the relevant product standards in order to be lawfully placed on the market.

2. INTRODUCTION AND BACKGROUND

Following a decision by the Minister for Communications and Tourism, a Working Group under the chairmanship of the National Telecom Agency was set up in the spring of 1993.

The Group was to map out the interference problems of the hearing-handicapped caused by GSM cellular mobile telephones in connection with the use of hearing aids.

Apart from representatives of the National Telecom Agency, the Working Group counted among its members representatives of the organizations of the handicapped, the Centre for Technical Aids for Rehabilitation and Education, the hearing aids industry, GSM telephone manufacturers, GSM operators, approved GSM and EMC laboratories, and DELTA, the Technical-Audiological Laboratory (TAL) affiliated to the Danish Academy of Technical Sciences.

The Group's first Report, "Hearing Aid Interference Caused by GSM Cellular Mobile Telephones" was submitted to the Minister on 10 June 1993. The Report gives an account of the problems of interference with hearing aids caused by GSM cellular mobile telephones; further, the Report contains a description and evaluation of alternative solutions which might remedy or limit the problem.

The National Telecom Agency's forwarding letter appears as Appendix 1.

The Report further contains a list of the activities which, in the opinion of the Group, should be launched as soon as possible to create a basis for reducing the disturbances caused to users of hearing aids by the GSM system.

The list covers the following five activities:

1. Preparation of specifications for the measurement of interference with and disturbance of hearing aids caused by GSM cellular mobile telephones
2. Measurement of selected hearing aid types
3. Development of constructional changes of critical hearing aids
4. Information of users and clinics about the properties of different hearing aids with regard to GSM interference
5. Promotion of international standardization work

It appears from the Ministry's reply to the Report that the Working Group has been invited to continue its work in accordance with the suggested activities and to submit a new report before the end of June 1994 on the activities in progress.

The Ministry's reply is attached as Appendix 2.

The Report by the Working Group is contained in the following and the listed activities are dealt with separately under sections 4-8 of the Report.

2.1 Terms of reference of the Working Group

The terms of reference of the Working Group of 17 March 1993 are attached as Appendix 3.

The Ministry has complied with a request to extend the terms of reference of the Working Group to comprise a study of the interference, if any, caused by the use of DECT, Digital

European Cordless Telecommunications, as was the case for GSM cellular mobile telephones.

The request to extend the terms of reference of the Working Group appears as Appendix 4 hereto.

2.2 Problems connected with the transitional provisions of Directive 93/42/EEC, (Directive concerning medical devices) and Directive 89/336/EEC (EMC Directive)

The preparation of a product standard for hearing aids concurrently with the expiry of the transitional provisions of the EMC Directive on 1.1.1996 will facilitate the fixing of stricter requirements to the immunity of hearing aids to e.g. GSM radiation.

However, the work in the Group gave rise to a further study of whether the entry into force of the Individual Directive concerning medical devices would mean that there would be no essential requirements as regards the immunity of hearing aids until expiry of the transitional provisions of that Directive on 13.6.1998.

This question is dealt with in sections 8.2 and 8.3 of this Report.

2.3 Changes in the representation in the Working Group

After publication of the first Report, a few changes have been made in the representation in the Working Group.

The GSM cellular mobile telephone manufacturers, represented by Ole Rasmussen of Dancall A/S and Jan Nottelman, Cetelco Mobiltelefon A/S, later decided to leave the Group and to be represented by a trade organization, the Danish Electronics Industry Association.

Ole Dyrland who represented the Technical-Audiological Laboratory when the first Report was prepared, in this case represented GN Danavox A/S (OTWIDAN).

Mogens Wiederholt, who, when the first Report was prepared, represented the Centre for Technical Aids for Rehabilitation and Education, in this work represented the Centre for Equal Treatment of the Handicapped. The former Centre was subsequently represented by John Gjøderum.

At the request of the trade organization of Danish Hearing Aids Manufacturers' Association also this category was represented in the Group.

The NTRA, Norway, who wanted to participate in this field, was invited to attend meetings of the Group.

2.4 Meetings and activities of the Group

Five meetings were held in connection with the preparation of this Report:

27 October 1993
26 January 1994
18 April 1994
18 May 1994
14 June 1994.

Minutes covering decisions were prepared after each meeting.

2.5 About the background of this Report

This Report is the result of many contributions by the members of the Group. Each member contributed within his sphere of expertise and these contributions were put together to form an integrated whole.

As was the case with the first Report, cooperation was based on reliance on the correctness of contributions, rather than on mutual control.

A principle of consensus has been followed, as defined by the International Standardization Organization (ISO): Consensus is "... characterized by the absence of sustained opposition to substantial issues ...".

3. DECT SYSTEMS

DECT (Digital European Cordless Telecommunications) is a cordless telephone technique which, as in the case of GSM, uses a digital modulation of the radio channel. Frequencies in the 1880-1900 MHz area are used, totalling 10 channels, each with a band width of 1.7 Mhz. In the course of 10 ms, 24 time slots are disposed of, 12 from mobile to base and the other 12 from base to mobile. An average output power of 10 Mw (250 Mw peak power) is used. The DECT system is intended for distances between 5 m and 250 m between the mobile terminal (portable part) and the base station. As a consequence, DECT is referred to as a "pico-cellular system". Coverage of large areas (such as shopping centres) is achieved by using many base stations. The system has automatic handover between individual base stations.

Where a GSM system is able to handle approx. 500 simultaneous calls within 1 km², the DECT system handles 10,000 simultaneous calls. This is why the DECT system is expected to be a great success for cordless telephones but also for cordless PABXs. Approx. 1/3 of all business telephones in the year 2004 are expected to be DECT terminals of a size corresponding to 0.2 l and weighing approx. 180 g. The first DECT systems were marketed already this year.

3.1 Interference from DECT

The lower output power, 250 Mw against GSM's 2 W, indicates that less interference may be expected. It should be considered in this connection, however, that the field strength is reduced by the square root of the output power, which means that the field strength of a

DECT telephone is 0.35 times the field strength of a 2 W GSM telephone over the same distance.

The audiosignal detected will have a basic frequency of 100 Hz, against 217 Hz for GSM. The degree of interference occurring at the frequency of 1.8 GHz cannot be immediately deduced from experience gained from GSM transmitting at the frequency of 900 Mhz; and the fact that base stations will be situated close to personnel in open-plan offices might also give rise to interference with hearing aids.

4. SPECIFICATIONS FOR MEASURING INTERFERENCE

The method applied to measure interference was devised by Telecom A/S, TD-L and TAL. This was done in connection with the "EHIMA GSM project - development phase" previously carried out at the laboratories for the European Hearing Instrument Manufacturers Association (EHIMA). The method has been described in detail in "EHIMA GSM Project - Development phase, Project Report (revision A)".

This measuring method is used to determine the immunity of the hearing aid when exposed to a well-defined electromagnetic field simulating the field strengths to be expected from GSM and DECT telephones.

4.1 Measuring method

The acoustical parameters of the hearing aid were determined at TAL in accordance with the IEC 118-0 standard. In order to avoid that the field around the hearing aid was influenced, tubing of 500 mm was used. The metallized IEC 711 coupler was therefore not placed immediately next to the hearing aid. Volume control was fixed in the reference test gain position and subsequently the basic frequency response was measured.

The hearing aid was then exposed to a simulated GSM¹ or DECT² signal at a field strength of 10 V/m, corresponding to the field strength of a 2 W hand portable GSM telephone at a distance of 1 meter or to that of an 8 W fixed GSM telephone at 2 meters' distance in the anechoic chamber of TD-L. The hearing aid was placed in a position corresponding to normal use; it was then rotated clockwise in steps of 90°.

0° corresponds to an orientation where the hearing aid microphone points towards the antenna (vertical polarisation). The total sound pressure level of the hearing aid was read at four points: 90°, 180°, 270° and 360°.

In the position which involves the highest sound pressure level, the aid was exposed to field strengths of 1 V/m, 3 V/m, 10 V/m, 30 V/m and 100 V/m. Fast fourier transformation was used to analyse the signal at the lowest field strength where the sound pressure level is at

¹ Carrier 900 MHz, 100% AM pulse modulation at 217 Hz, duty cycle 1:3

² Carrier 1.8 GHz, 100% AM pulse modulation at 100 Hz, duty cycle 1:24